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(54) Title: <b>ON-LINE RECRUITING SYSTEM WITH IMPROVED CANDIDATE AND POSITION PROFILING</b> (57) Abstract <p>A network based recruiting system accepts and provides information across a wide-area network (WAN) such as the Internet. The system matches job openings with candidate information and includes a job packet generator which creates a job opening data packet containing encoded information corresponding to a plurality of predefined categories for a job opening. A database stores a plurality of the job opening data packets. An applicant data packet generator responds to encoded information received over the Internet from an applicant and creates an applicant data packet, which contains encoded information corresponding to the plurality of predefined categories for the job opening. A data packet matcher responds to receipt of the applicant data packet by comparing, in accordance with a predefined comparison protocol, the applicant data packet to the job opening data packets stored in the database. The data packet matcher stores results of the comparison to the database. Other databases containing candidate information may also be queried.</p>		

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## ON-LINE RECRUITING SYSTEM WITH IMPROVED CANDIDATE AND POSITION PROFILING

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### RELATED APPLICATIONS

This application claims priority to provisional application Ser. No. 60/060,346, filed September 29, 1997, entitled "On-Line Recruiting System."

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### FIELD OF THE INVENTION

This invention pertains generally to the field of computerized data processing systems and more particularly to networked data processing systems for facilitating the task of screening and recruiting of individuals by organizations.

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### BACKGROUND OF THE INVENTION

For many companies, effective recruiting is critical to the success of the business. Traditionally, human resources, or employment groups within a company are charged with finding qualified candidates, tracking those candidates through the hiring process, generating offer letters, reporting on hiring activities and complying with employment laws and regulations. In larger organizations, no one knows better than the hiring managers the requirements for open positions under their supervision.

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In larger, technology-based companies, engineering managers write job descriptions which are forwarded to the Human Resources (HR) department. HR then has the responsibility to locate qualified candidates, based upon screening resumes, for the hiring managers to interview. Once an offer has been made, HR is responsible for managing and completing the hiring process.

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The resume is a very poor instrument for matching engineering candidates with job openings. For many people, an effective resume is difficult to write and therefore becomes little more than an employment history, failing to address the more

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significant aspect of specialized skills and capabilities. As a result, companies have come to increasingly rely on expensive in-house technical recruiters or outside agencies - charging 20 - 30 percent of the starting salaries - to read, interpret and filter the growing wave of resumes.

5 Recruitment and hiring today requires systems that let hiring managers define and create queries independently, at their desktops, and which let them directly access candidate databases. HR, in turn, needs to maintain responsibility for job requisition approvals, applicant tracking, employment offers and employment compliance and reporting.

10 Computerized systems have been developed to log, scan and track resumes. Resume automation software employing expert system technology also exists to replicate the "knowledge" of experienced recruiters to facilitate the screening process. Such automation software interprets the meaning of thousands of terms, understands context and then matches qualified candidates to available jobs. Unfortunately, many  
15 such systems perform this intended task with only marginal success.

As technologies and engineers have become more specialized, the resume has become still less useful at qualifying and communicating candidate skill sets. And with the spread of resume automation software, job seekers now "load" resumes with keywords to increase the probability of getting through the computerized screening  
20 process and onto the hiring manger's desk.

The Internet, as well as other wide-area networks (WANs), provide a rapid, low-cost communication mechanism for exchange of information pertaining to recruiting. Ideally, an effective recruiting system should allow use of WANs to further facilitate the recruiting process. What is needed therefore is a recruiting system which  
25 overcomes the limitations inherent in a resume based system and which makes use of readily accessible networks.

## SUMMARY OF THE INVENTION

In a principal aspect, the present invention provides an electronic, network  
30 based recruiting system that facilitates entry, retrieval and matching of data regarding candidates and job openings. In accordance with the principles of the invention, a

network based recruiting system includes a job description module which generates a job profile corresponding to predefined characteristics of a job position in response to inputs by a first user of the system. An applicant description module generates an applicant description profile corresponding to predefined characteristics of an applicant, in response to inputs by a second user of the system. A database stores a plurality of the job profiles and receives the applicant description profile over the network. The system also matches characteristics of the applicant description profile with corresponding characteristics of the job profiles.

In accordance with further aspects of the invention, the job profile comprises at least one packet, which is formatted to comprise a plurality of alphabetic characters, a plurality of numerical digits, and a plurality of operators indicating relationships between combinations of the alphabetic characters and the numerical digits. The plurality of operators may comprise at least a first logical operator for describing a logical relationship between a first and a second of the alphabetic characters and between a first and a second of the numerical digits. At least a first comparison operator may be provided for comparing the first and second of the alphabetic characters and comparing the first and second of the numerical digits. The plurality of operators may further comprise a list operator for designating a beginning and an end of a string of the alphabetic characters, or a numeric operator for designating a beginning of a numeric expression comprising a plurality of the numerical digits. The comparison operator may comprise a between operator which designates a numerical range. The plurality of operators may further comprise a preference operator which indicates a preference designated by a string of at least a first of the numerical digits.

Embodiments employing the principles of the present invention, advantageously benefit from a profile language system that does a faster, cheaper and more accurate job of matching job requirements to engineering candidates than do artificial intelligence (AI) systems or technical recruiters. The profiles are stored in the aforementioned database which is accessible to hiring managers. Hiring managers therefore have direct access to the self-service profile database, facilitating the rapid identification of qualified candidates – reducing the workload of HR (human

resources) personnel, and significantly reducing the need for contract technical recruiters and the expense of outside agency fees.

Using the profile language on a corporate Web site shifts a significant and growing data-input load from a company onto the candidates. Connecting the profile database to the Internet allows the company to easily collect, screen and archive very large numbers of candidates, significantly reducing the need for outside recruiters and agencies. Accessing the profile database, a hiring manager can search, for example, 100,000 candidates in a few seconds for all qualified individuals compared to searching a 100,000 record resume file using key word searches and then reading the resumes, easily a four-to-six hour task. The larger the database, the fewer the agency fees. Depending upon the company, outside agency fees are paid in anywhere from 20-to-60 percent of hires and this could be cut anywhere from 50-to-75 percent.

The above features can significantly reduce both the "cost-per-hire" and "time-to-hire" aspects of hiring a candidate. In general, cost savings can be derived from four principal categories: reduced recruiting costs, reduced agency fees, reduced travel costs and more productive personnel. A number of factors contribute to such savings.

First, once the company's Web site is operational, candidates can easily and quickly be added to the database at little cost. The larger the database, the fewer the fees. Second, the precision of the profile matching system reduces the probability that qualified individuals in the database are being overlooked (Qualified candidates are often missed in existing databases due to the complexity and imprecision of current search methods). Third, it is possible to search third-party profile databases and pay small match fees rather than large agency fees. Fourth, in-house candidates can be identified from profile databases of current employees. Fifth, the in-house database becomes a source of new candidates by e-mailing openings to disinterested candidates and asking for referrals. Using the Internet as the primary input and communications link with candidates significantly reduces telephone-tag (many candidates are notoriously difficult to reach by phone, but use e-mail regularly), thereby reducing turn-around time and cutting both labor and communications costs. E-mailing job descriptions to candidates in the database promotes additional "referrals" as uninterested candidates can easily pass the "opportunity" on to associates.

Moreover, the confidential nature of the profile language allows for the development of and access to third party profile databases, further expanding the universe of candidates. HR personnel are freed from the technical screening process, allowing them to better manage the logistics of the interviewing and hiring processes.

- 5 The profile system can be used to create a database of in-house skills for identifying existing employee candidates via an Intranet. This capability is invaluable to large companies and to companies acquiring and integrating other technical organizations. HR productivity is significantly improved through computerized candidate tracking and logging, reduced paper work and improved communications and record keeping
- 10 between hiring managers and HR. Reporting for EEO (Equal Employment Opportunity) compliance is also facilitated. Better candidate tracking prevents qualified candidates from falling through the cracks. The interviewing process is faster and more effective with automated scheduling and coordinating of interview teams and the networked distribution of interview forms and questionnaires.
- 15 Travel costs are reduced by elimination of unnecessary expenses associated with bringing in inappropriate candidates or the same candidate for multiple interviews. As many as 20 percent of candidates interviewed require paying travel costs. These costs can be reduced by getting more candidates from the local area due to a company's much larger database and the ability to inexpensively tap third party
- 20 profile databases for local candidates. Advertising costs are reduced as the number of candidates increases on the Internet and in the profile databases. Double or triple agency fees are eliminated due to better tracking of resumes and candidate sources. Quality information is available to HR and operating management to accurately track "time-to-hire" and "cost-per-hire." Accurate and up-to-date salary surveys can be
- 25 created from the profile database, saving on expensive third-party surveys.

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These and other features and advantages of the invention will be understood by considering the following detailed description of certain preferred embodiments. In the course of this description, reference will be made to the attached drawings.

## BRIEF DESCRIPTION OF THE DRAWINGS

Figure 1 is a high-level block diagram of an Internet based recruiting system that employs the principles of the present invention.

5        Figure 2 is a flow chart illustrating use of the recruiting system by a hiring manager.

Figures 3(a) and 3 (b) are flow charts illustrating use of the recruiting system by a candidate.

Figures 4(a) and 4(b) are flow charts illustrating further details of Figure 3.

10       Figure 5 is a block diagram showing major functional components of a preferred embodiment of the recruiting system of Figure 1.

Figure 6 is a block diagram illustrating organization of the information 120 of Figure 1.

15       Figures 7, 8(a) and 8(b) are flowcharts illustrating operation of automatch module 502 of Figure 5.

## DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

In Figure 1 of the drawings, a Recruiting System (RS) 100, which employs the principles of the present invention, exchanges information with a publicly available  
20    wide-area network such as the Internet 102 and a private network such as an intranet 104. RS 100 transmits and receives information by way of World Wide Web (WWW) pages that are accessed by conventional browser software, such as Netscape Navigator available from Netscape Corp., or Internet Explorer available from Microsoft Corp. Such browser software allow a user to view and transmit data in a variety of formats  
25    including text and HTML (HyperText Markup Language). Web pages 116 and 118 typically correspond to Web pages provided by an organization to allow those from within and outside the company to view and submit various information. WWW page 116 is typically publicly available for viewing and use by applicants who are not employees of a company. Web page 118 is typically available only to employees of a  
30    company who have access to information contained on the companies Intranet. Pages 116 and 118 are shown separately for purposes of explanation. Such pages may well be



one and the same page if no differences are desired or required in information available to those inside or outside an organization.

RS 100 operates to receive information from a hiring manager 106, an applicant (candidate) 108, outside agencies 110 and databases 112 and 114. Advantageously, recruiting system 100 streamlines the recruitment process between job candidates and hiring companies -- and within organizations. It gives hiring managers 106 more direct access to more qualified candidates 108 while giving human resources (HR) personnel a comprehensive package of security, applicant tracking and reporting capabilities to improve the control and integrity of its recruitment and hiring processes. Information entered by a hiring manager 106 to describe a position or by an applicant 108 to describe him or herself is advantageously stored in database 112 as a profile 120 that contains in a compressed format (described in more detail below) the relevant and necessary information pertaining to the position or applicant. Database 112 preferably takes the form of a conventional relational type database. Profiles 120 stored in database 112 may be designated to be confidential, meaning they are available only to specified individuals or groups of individuals. Profiles 120 designated as public have no restrictions as to their availability. Database 114 may be supplied by third parties as a source of information on candidates 106. Typically, a fee is charged by the provider of such databases for the use thereof. Databases 114 may store information categorized as public or confidential. Information stored in database 114 may be stored in the form of profiles 120, as further described herein or in any one or more conventional formats. Matching module 105 operates to compare profiles of candidates with profile of job openings.

Figures 2, 3(a), 3(b), 4(a) and 4(b) illustrate use of RS 100 by hiring manager 106 and applicant 108. Turning to Figure 2, hiring manager 106 opens a new job requisition, step 202, edits the requisition, step 204, and submits it for approval, step 206. Steps 204 and 206 are repeated to modify the requisition until it is approved, step 208. The job requisition is preferably a free-form text description of the specific job responsibilities.

If the job requisition is determined at step 210 to be open to outside sources (such as candidates 106), then job profile 120 is created at step 212 by the hiring

manager 106. The job profile 120 is advantageously created by way of a simple, point-and-click, hierarchical, drill-down process. The resulting job profile 120 is a standardized datapacket containing the discipline, skillset and experience required to fill a new job opening. Once generated, approved, the job profile 120 is automatically  
5 posted to the company's profile-matching database 112 at step 214, and a text version is posted, at step 216, to the organization's Web site (116, 118) as a new job opening.

Job seekers 108 coming to the company's Web site 116, 118 may then review opportunities. To apply for a specific opening they are instructed to use a similar hierarchical, drill-down menu containing professional, technical and recruitment  
10 terminology. This process automatically and quickly creates a personalized profile known as a candidate profile. A candidate profile is a standardized datapacket containing an individual's professional expertise. It preferably includes:

- a) professional level (officer, director, individual contributor, etc.)
- b) discipline (engineer, lawyer, accountant, etc.) and
- 15 c) skillset (C++ programming, environmental law, etc.) and
- d) experience levels (numbers of year, competencies, etc.)

The foregoing types of information are merely illustrative and other information that may be considered in the living process can also be included in the candidate profile 120.

20 The creation of candidate profile 120 is designed to encapsulate an individual's capabilities and interests, and their contact information, including their e-mail address. The candidate has the option of including their name, employer and/or attaching a resume. When the individual has finished defining his qualifications, the new candidate profile 120 is submitted to the database 112.

25 Figures 3(a) and 3(b) illustrate use of RS 100 by a applicant 108. The applicant using a personal computer or device with similar functionality logs onto the RS 100 at step 302 by way of web pages 116 or 118. The applicant 108 then enters salary related information at step 310 or 312 depending on whether the salary information represents hourly pay or non-hourly (professional pay) (see, step 304). Steps 310 and 312 are only  
30 performed if the applicant 108 is a new user of RS 100 as determined by steps 306 and 308, meaning that the applicant 108 has not previously entered information into RS

100. If the applicant 108 has previously used RS 100 to enter salary information, then a salary profile page (314, 316) is provided to allow the applicant to view and edit previously entered salary information.

Figure 3(b) illustrates the information entered by the applicant 108 for steps 310 or 312 of Figure 3(a). At step 330, the applicant 108 enters an electronic mail (e-mail) address and a user identification (ID). The e-mail address supplies the information necessary for a hiring manager 106 to communicate with the applicant 108.

Communication by e-mail is rapid, inexpensive and easy to use and is therefore a preferred means of communication. However other methods of communications may

be effected by entry of appropriate information such as a phone number, facsimile number or postal address. The applicant 108 controls release of any and all private contact information and can specify that contact not be made by e-mail. The user ID provides a unique, and confidential, way of identifying the information entered by the applicant 108. At step 332 the applicant 108 enters a category of the position being sought. For example, the category may be technology, medicine, law or finance. Next, at step 334, the job level is entered, such as vice-president, director, manager, partner, individual, chief. Next, at step 336, the discipline within the category entered at step 332 is entered. Examples of disciplines include, hardware, software, surgeon, specialist. Next, at step 338 the area of specialty is entered, such as aerospace, communications, real estate law, brain surgery. Next, at 340, the information entered at steps 330-338 is stored to database 112. The applicant 108 then goes to the salary profile page 314/316.

Matching module 105 generates matches between candidate profiles and open job profiles. When the matching module 105 profile database 112 detects a match

between a job profile and a candidate profile, the system 100 notifies the hiring manager 106 that a qualified candidate 108 has just applied for an open position. The hiring manager 106 may then view the candidate's profile information. The manager 106 then has the option of contacting the candidate by e-mail to get additional background or, through HR, set up an interview. Non-matching profiles are saved and the database begins to grow. When the next job profile is submitted, the matching module 105 identifies all of the candidate profiles that match the new job's

requirements. If the match results in too many or too few candidates, a manager can alternatively tighten or relax skill requirements to arrive at the best short-list of qualified candidates. The applicant 108 can periodically, access the web page 116, 118 to determine if any matches with job openings have been made. Advantageously, the web page 116, 118 accessed by the applicant 108 to check the status of matches is confidential to each particular applicant. If a match has been made then the applicant can read the accompanying job description and elect to release further information about the applicant or reject the position. In addition to automatching, in which the matching module 105 periodically, without specific user invocation, performs matching, the applicant 108 can use the EPL matching module 105 to manually search the database 112 or, if access is permitted, the database 114. Alternatively, if the applicant does not wish to periodically access the pages 116, 118 then an option can be selected to be notified of job matches by other notification mechanisms such as e-mail, fax, pager or mailing of a postcard.

The principal advantage of the profiles described herein is that both the hiring managers 106 and the candidates 108 are now "speaking" the same language. This makes it fast and easy for the database to match job opening with only qualified candidates without the intervention of highly-paid technical recruiters or the reliance on resume automation software. The system automatically filters out all the unqualified applicants taking an enormous load off the organization.

Since candidates 108 have the option of submitting confidential profiles – with anonymous e-mail contact information – currently employed individuals may post their qualifications to the profile database 112 and wait to be notified when a position for which they are qualified becomes available.

Once qualified candidates have been identified from the profile database, they are automatically inserted into software that tracks, manages and reports on the internal interviewing and hiring processes – significantly reducing paperwork and accelerating the time-to-hire.

Alternatively, hiring manager 106 may generate queries to the database 112. Figure 4(a) shows steps performed by hiring manager 106 on applicant profiles 120 in database 112. At step 402, the hiring manager generates a query to the database 112

and reviews information from retrieved profiles 120. Applicants 108 that are not qualified, step 404, are marked as being rejected for the position under consideration.

If the candidate is qualified then, if at step 408 the candidate is from outside the organization, contact information regarding the candidate is requested at step 410 from

5 database 112. This request is made to the database 112. If the candidate is from within the organization, then at step 412 an interview, in-person or telephone is set up. The hiring manager 106 accesses the RS 100 by way of web page 118 which provides a confidential input and output mechanism for each hiring manager. The information provided by web page 118 allows entry and tracking of multiple job openings and  
10 multiple candidates. In addition to automatching the hiring manager 106 can cause manual searching of the database 112 for potential candidates by generation of job profile. The hiring manager 106 is advantageously allowed to view potential candidates at each level of the profiling process.

Figure 4(b) shows the steps taken when contact information is requested at step  
15 410. RS 100 causes an e-mail message to be sent to the candidate. The e-mail message informs the candidate at step 420 to query the web page 116/118 to receive information regarding the position or positions the hiring manager 106 has determined are suitable for the candidate. If the candidate is interested in pursuing the position(s) (step 422) then the candidate sends an affirmative response (step 424), which may include further  
20 contact information to the RS 100, which causes the hiring manager 106 to be so notified. If at step 422 the candidate decides to not pursue the position(s), then at step 426, the candidate sends a negative response to the RS 100, which causes the hiring manager 106 to be so notified.

When hiring manager 106 generates a query at step 402, third-party database  
25 114 may also be reached in response to the query. The hiring manager may be provided with the option of including third-party database 114 in a query, or alternatively, inclusion of such database may be transparent to the hiring manager 106.

Recruiting system 100 is preferably implemented with a plurality of software modules that manage and improve communications both between hiring managers  
30 and HR personnel and within the HR department to further speed the hiring process and streamline the in-house work flow. Figure 5 of the drawings illustrates the major

functional components of RS 100. The software modules shown in Figure 5 preferably operate in a networked environment and are designed to run in Microsoft environments and to communicate with commercially available resume tracking and SQL (Structured Query Language) database products. It should be noted that the implementation of RS 100 shown in Figure 5 is merely illustrative of an exemplary embodiment. The exact manner in which the functions performed by RS 100 are implemented is not critical, and numerous variations will be apparent to those skilled in the art in view of the description herein.

Automatching is performed by an automatch module 502 which preferably takes the form of a stand alone module that runs on a single use computer connected to the database 112. The automatch module 502 performs matching based on simple text strings that are compiled from drill downs, explained in further detail in connection with Figures 6, and 7. The complete profile of a candidate may be broken down into the following parts:

Part 1 - Focus and skills, e.g. general profession (engineer, lawyer, sales, technician)

Part 2 - Field, e.g. computer software, publishing, natural gas exploration

Part 3 - Company [Type and Size]

Part 4 - Job [Type and Length]

Part 5 - Compensation [amount]

Part 6 - Management Experience [length, and type, such as number of people managed]

Part 7 - Spoken Languages

Part 8 - Education [level of education, such as years of schooling and/or

degree(s)]

Part 9 - Citizenship/Visa Status [yes/no and type of visa status if applicable]

Part 10 - Security Clearance [yes/no, and type of clearance if applicable]

Part 11 - Location [current state or municipality, i.e. the general area in which the candidate currently resides]

Part 12 - Relocation [yes/no answer as to whether relocation is acceptable and if acceptable, then general parameters of acceptable locations, such as within current state, country, etc.]

5 The match performed by the automatch module 502 is advantageously implemented on the database 112 using SQL calls and triggers.

The inbox/job tracker module 504 performs the following functions in response to inputs from candidate 108: display new matches, display jobs applied for, on-hold display and display all. The display new matches function causes display of any new jobs that have come into the system 100 that the candidate 108 matches. The candidate  
10 108 then has the option to look at the detailed job description. At this point the candidate 108 can then do the following:

- a) Apply for job. Then contact info is sent to hiring manager 106.
- b) Reject job. The job is removed from Inbox and hiring manager 106 is notified that candidate 108 rejected the job.
- 15 c) Put on Hold. The job is put in an On Hold Box for 2 weeks, then automatically removed.
- d) Do nothing.

The display jobs applied for function causes display of all jobs the candidate 108 has applied for and the status of each job. The on-hold display function causes display  
20 of all jobs that have been put on hold. Jobs are cleared after being On Hold for 2 weeks. If hiring manager 106 has requested contact information from a candidate and candidate puts them on hold, a message is sent to the hiring manager indicating the candidate has put the job on hold. The display all function causes display of all current and past activity. Sort options and date parameters may also be provided under the  
25 display all function. The inbox/job tracker module 504 is preferably implemented using Microsoft's Active Server technology, Java and JavaScript as specified by Sun Microsystems.

The resume writer 506 is a tool designed to make composing a resume a simple task. The resume is broken down into separate parts that can be viewed or edited at  
30 any time. All data input and editing is done in two screens:

(1) PERSONAL INFORMATION (Edit Screen) - This includes all personal and non-work related information.

(2) WORK HISTORY (Edit Screen) - Work History is broke into 2 parts.

(a) Part 1 - The companies candidate 108 has worked for are entered in chronological order.

(b) Part 2 - For each company candidate 108 describes each major project worked on. Project descriptions by selecting a 'project' button at the appropriate company.

Several other screens provide views of the candidate's data. A VIEW RESUME screen (View Screen, non-editable) shows all the information compiled into a standard looking resume. A PRIVATE INFO screen (View Screen, non-editable) shows information that is confidential. A PUBLIC INFO screen (View Screen, non-editable) shows information that a hiring manger can view at any time. A PRINT RESUME screen (View Screen, non-editable) shows the resume with no headers or menus. The resume writer module 506 may include or be supplemented by an intelligent resume writer module that allows companies and projects to be linked to profiles. That way when a match is made the companies and projects that highlight that specialty are automatically compiled into a standard looking resume and sent to the hiring manager.

The candidate also has the option of storing multiple resumes. The candidate assigns an identifier to each resume and has the option of sending particular resumes to individual jobs. The resume writer module 506 can advantageously be downloaded to the candidate's personal computer and can be used a stand-alone product for compiling resumes.

The job locator module 508 allows candidates to find their own jobs. It employs a search engine that employs a syntax referral to herein as an Employment Packet Protocol (EPP), described below in conjunction with Figure 6, to locate jobs. The candidate can then submit their resume for the job. Hiring managers 106 are notified that a candidate 108 has applied for the job, but their profile does not match. The hiring manager 106 may or may not be given the option of not allowing people to apply unless their profile matches. The job locator module 508 may include, or may be



supplemented with, an intelligent job locator module that incorporates fuzzy logic to assist candidates in finding jobs.

The EPP is used by hiring managers and the job description module 510 walks a hiring manager through the EPP and a few simple text fields to complete a detailed job description. The module 510 may take the form of downloadable module similar to the resume writer module 506.

The hiring manager can then submit the job to the database 112 and be billed for posting a job. They can print off a copy of the job description to give to a candidate or recruiter. Once the job is submitted the hiring manager will receive candidate matches.

The candidate locator module 512 is almost identical to the job locator 508 and uses the EPP to locate candidates. The hiring manager 106 can then send a job description to a candidate 108 and have this show up in the candidate's new jobs box, similar to an automatch. The candidate is notified that the hiring manager has already viewed their background and is interested in talking. The candidate locator module 512 may include, or may be supplemented with, an intelligent candidate locator module that incorporates fuzzy logic reasoning to find candidates.

The candidate PS (point and squirt) module 514 takes the form of a software downloadable module. It allows the user to compile a resume and use the EPP off-line. Then the user can go to a web site operating in accordance with the principles described herein and click a button and upload all the EPP and resume data. The user is also given a simple database to track all the sites they have registered with and check matches at those sites.

Profiles 120, which are generated in accordance with the EPP, advantageously provide a uniform set of rules to allow candidates to describe their expertise and the hiring managers to define job openings. This leads to a number of advantages. The need for complex artificial intelligence type systems is eliminated and matches can be made in seconds across very large databases. Multiple databases can be queried per request so that candidate searching is not limited to local resume pool. End users are empowered to enter very detailed information. This eliminates the need for non-technical personnel making matches based on limited keyword vocabulary. Expertise is placed at the point of entry. Data is encrypted and anonymous. This allows sharing

of data across the Internet without fear of breaching confidentiality and allowing candidates to register anonymously. Moreover, matches are made automatically by the automatch module 502; there no need to requery database once information is added. Candidates can see detailed job descriptions for every opening matched.

- 5       The profiles are preferably generated by an intuitive graphical interface. The profile generator takes only a short time to complete and eliminates the need for a resume. Profiles are generated in such a way that a certain amount of knowledge about the specialty being described is required. This way candidates are unable to pick keywords at random and must exhibit some knowledge of the specialty. In an
- 10       exemplary embodiment, candidates are only allowed to generate three profiles. This forces candidates to describe their strengths and does not allow them to generate profiles for weak or marginal skills. This is a major weakness of resumes.

- Profiles can be removed from the system manually if after talking with the candidate it is deemed they have exaggerated their skills. This eliminates repeated hits
- 15       on unqualified candidates. Source of profiles are displayed on queries. Hiring manager 106 can then choose candidates in local database 112 before going to outside sources, however all qualified candidates are displayed, regardless of source. Profiles can be generated for query only purposes. This allows hiring managers to see if candidates are available for hire when scheduling new projects.

- 20       Entry of information in accordance with the EPP is advantageously structured in a maneuver referred to herein as a "drill-down tree." The Drill Down Tree (DDTree) of the RS 100 is organized as a tree of unlimited degree with one root node and is shown in simplified form in Figures 6 at 602. As shown in Figure 6, root node 603 is on a 0<sup>th</sup> level and distinct high-level entities used for matching are on the 1<sup>st</sup> level 604.

- 25       These 1<sup>st</sup> level entities are preferably the following: focus and skills, field, company [type and size], job [type and length], compensation, management experience, spoken languages, education, citizenship/visa status, security clearance, location, relocation.

- The DDTree has unlimited depth, meaning that each of the 1<sup>st</sup> level nodes 604 can have any number of child nodes (on level 605), each of those child nodes can have
- 30       any number of its own children and so on as shown at levels 606 and 607. The nodes of the DDTree 602 are represented as records in a database letter as shown at 610. The

table 610 comprises a plurality of records (rows) with columns for the following properties:

- *Code* - a unique four-character string
- *Parent* - a code of the parent node
- 5     • *Caption* - a string associated with a node
- *Equivalent* - link to another, equivalent, node that should be used instead of this node; equivalents are used to allow different routes to the same node. One example: two routes to a database software developer - through engineering/software and through business/MIS. Another example - two routes to France - through  
10   location/continents/Europe and through location/EC (European Community) members.

- *List Parent* - Specify lists with multiple choice. One example: relocation where an applicant is willing to relocate to any of the countries in the list. Another example - software languages that an applicant knows. Lists are not ordered.

15     In addition each node can have properties that specify a measure that can be satisfied by a range of values, together with the range of acceptable values. An example of such a measure is the number of years of experience, or a ranking on a specified scale.

Advantageously, the DDTree is defined by a single table in database 112.

20   Changes to the DDTree can therefore advantageously be implemented simply by adding, changing or deleting entries in this table.

The DDTree is used to build profiles which are concise definitive sets of information about applicants or job. There are two types of applicant profiles - one built by applicants to describe themselves and their requirements and another built by  
25   hiring managers to describe requirements for successful candidates along with what a job offers (compensation, location etc.). The former is referred to herein as an Applicant Profile and the latter a Job Profile. Both profile types are expressed in exactly the same way therefore creating a foundation for successful matching.

The applicant or job profile are shown at 620 in Figure 6. The profile 620  
30   contains packets of information obtained from the DDTree 602/610. In the example shown in Figure 6, a user (hiring manager or candidate) using the DDTree 602/610 has

selected node 3 at level 605, node 1 at level 606 and node 1 at level 607. The information entered by the user is stored in table 620 which has a structure similar to that for table 610. Specifically, each selected node contains a corresponding record in table 620 to identify the selected node by way of the unique code for the node. In

5 addition, table 620 contains the textual description of the selected node (Node. Descr.), the id of the parent node (Parent ID), whether the selected node provides a single choice or multiple choices (Choice ID) and a unique id of the user (User ID).

As the user makes choices, the RS-100 stores this information in table 620 that becomes attached or linked in some manner to a resume if the user is an applicant, or  
10 to an unstructured (e.g. text) job description if the user is a hiring manager. A complete profile (applicant or job) is made up of multiple records in the profile data table 620.

The information entered at each node by the applicant or hiring manager is entered and stored as a phrase built using a special alphabet that includes the 26 letters  
15 of the English alphabet, 10 digits and the following operators:

- **logical operators:**

- & - logical AND

- / - logical OR

- 20 • **comparison operators:**

- GT - Greater than

- GE - Greater than or equal

- EQ - Equal

- LE - Less than or equal

- 25
  - LT - Less than

---

- BT - Between

- **list operator:**

- : - marks the beginning and end of a list expression

- **numeric operator:**

- 30
  - # - marks the beginning and end of a list expression

- number separator:

/ - separates two numbers of a numeric expression when operator BT is used

- year operator:

@ - marks the beginning of a year expression

- 5 • preference operators:

+ - prefer

- - prefer not (undesirable)

A packet phrase can contain the following types of expressions:

- 10 ■ code - consists of four-letter node code(s)
- logical - combines other expressions with ANDs and ORs
- list - list operators surrounding logical expressions that contain list item codes
- numeric - numeric operator followed by comparison operator and a number
- 15 or two numbers with a number separator between them
- year - year operator followed by comparison operator and a number or two numbers with a number separator between them
- preference - a preference operator (+ or -) followed by a number that specifies percentage of appearance in the resulting set (this is for "soft" or
- 20 fuzzy search)

Matching of applicant profiles with job profiles, or vice-versa, is preferably accomplished by the steps shown in Figures 7, 7(a) and 7(b). The steps shown in

- 25 Figure 7 are preferably executed periodically (such as every 24 hours) by the RS 100 to prepare the job profile data in database 112. The routine shown in Figure 7 prepares the job profile data in database 112 by creating a JobMatch Dataset and by importing profile documents for each job to be matched. The JobMatch Dataset contains all active job openings, in other words job openings that have not been temporarily or
- 30 permanently closed, in a particular group. Job profiles are typically organized in groups according to various criteria. For example, a database of job profiles may be

provided by a third party, and the automatch module could be limited to the jobs in that particular group. The JobMatch Datasort is generated by selecting job profiles at step 702 from a jobs table (such as table 610) in the database 112 and/or database 114. Steps 704-708 are then performed for each job selected. At step 704 a test is performed to determine if the job is still open or available and if so then at step 705 a test is performed to determine if the job is available for automatching. In certain embodiments the profile can contain an indication of whether the profile can be automatched, or whether it is only subject to manual matching. If the job is available for automatching, then at step 706 the data record for the job is added to the JobMatch Dataset. A test is performed at step 707 to determine if other jobs remain to be tested and if so then step 708 causes the next job to be subjected to steps 704-707.

Once steps 704-708 have been performed for all jobs selected at step 702 then a Job Tracking Data Table is created at step 710. This table is filled in the routine of Figures 8(a) and 8(b) when a match occurs between a job profile and an applicant profile. The information placed in the table includes information specific to the match such as the date and time of the match, and fields matched. Next, at step 712, corresponding profile tables are imported for each job to be matched. This step advantageously speeds up the automatch routine by having all documents readily available. Finally, the JobMatch data is stored at step 714.

Turning to Figure 98(a), the automatch routine is started by retrieving at step 802, a single JobMatch Data Record, which contains a job profile to be matched. Next, at step 804 an applicant group ID for each applicant profile is compared to the job group ID. The applicant group ID serves a purpose similar to the job group ID in that it allows grouping of applicants according to various criteria. At step 806, each applicant profile is checked to determine if it is active and if the expertise in each applicant profile matches that of the job profile under consideration. If both of these criteria are not satisfied, then the applicant profile is not further considered. The remaining applicant profiles are then used at step 808 to create a MatchedApplicants dataset. This data structure, which contains information for each of the applicants under consideration in the automatch routine is then used for comparison against the data in the JobMatch Data record, and modified as a result of the comparisons. For

convenience, in the remaining explanation of Figures 8(a) and 8(b) the data in the MatchedApplicants dataset is referred to collectively as "applicant data", unless otherwise specifically noted, and the data in the JobMatch Data Record is referred to collectively as "job data", unless otherwise specifically noted.

5 At step 810, the skill(s) for each applicant in the applicant data are/is compared with the skill(s) for each job in the job data. Applicant profiles having skills that do not match those in the job data are removed from the applicant data. At step 812, a test is performed to determine if an industry has been selected for the job in the job data. If so, then at step 814, applicant profiles in the applicant data not matching the industry  
10 selected in the job data are removed from the applicant data. At step 816, the specialty specified in the job data is compared to the specialty specified for each of the applicants in the applicant data and applicant profiles having non-matching specialties are removed from the applicant data. Corresponding comparisons and actions are performed at steps 818, 820, 822, 824, 826, 830, 832, 834 and 836, 838, 840 and 842 for the  
15 remaining parts of the profile, namely; salary, years experience, education, language fluency and casual knowledge, job location, company type, company size, job type, and number of people managed, departmental/corporate profit/loss responsibility, size of budget managed and management type, respectively. It should be noted that the process of removing non-matching data in the steps shown in Figure 8 can be varied to  
20 cause creation of new data structures containing the matching data, instead of removing non-matching data from the existing data structure.

At step 844, the applicant data is tested to determine if any applicant profiles remain after the preceding elimination steps. If so, then at step 846, for each applicant, a description of each job matched is placed in a recruiting system mailbox  
25 corresponding to the applicant, and the applicant's resume and profile are placed in the appropriate manager's recruiting system mailbox. Then, at step 848, an e-mail notification is sent to each applicant whose recruiting system mailbox was updated at step 846 to inform such applicants to check their recruiting system mailbox by way of an access to the web page 116/118.

30 Next, at step 850, or after step 844 if no profiles matched the job profile, then a test is performed to determine if all job profiles have been matched and if not, then the

routine is repeated from step 802 for the next job profile. When all job profiles have been considered, then at step 852 an e-mail notification is sent to each hiring manager who has submitted a job opening of the status of the automatch results. Specifically, the status includes the job profiles submitted by the hiring manager that were matched.

- 5 The hiring manger can then access the Web page 118 for further information on the matching applicant profiles.

A sample SQL statement generated by an embodiment of the automatch routine 502 is provided below:

10 Example AutoMatching SQL:

```
SELECT APData.ApplicantProfileID, Applicants.Active, Applicants.GroupID, Applicants.ApplicantID
FROM APData
```

- 15 INNER JOIN ApplicantProfiles ON APData.ApplicantProfileID = ApplicantProfiles.ApplicantProfileID  
INNER JOIN Applicants ON ApplicantProfiles.ApplicantID = Applicants.ApplicantID

WHERE Active > 0 AND data = 'AEJG' and

APData.applicantprofileid in (select APData.applicantprofileid from apdata where data = 'AEJG' and

- 20 APData.applicantprofileid in (select APData.applicantprofileid from apdata where data = 'ABHR' and

APData.applicantprofileid in (select APData.applicantprofileid from apdata where data = 'ADVX' and

APData.applicantprofileid in (select APData.applicantprofileid from apdata where (data = 'AAOE' or data = 'AEWK') and

APData.applicantprofileid in (select APData.applicantprofileid from apdata where (data = 'AANK' or data

- 25 = 'AEWJ') and

APData.applicantprofileid in (select APData.applicantprofileid from apdata where data = 'AAMB' and

APData.applicantprofileid in (select APData.applicantprofileid from apdata where data = 'AAND' and

APData.applicantprofileid in (select APData.applicantprofileid from apdata where type = 'Experience' and convert(int,data) >= 5 and

- 30 APData.applicantprofileid in (select APData.applicantprofileid from apdata where type = 'Salary' and convert(int,data) <= 100))))))))))

Select . . .

This represents the fields to be returned by the match string:

- 35 ApplicantProfileID and ApplicantID uniquely identifies which applicant is matched  
Active identifies the status of the applicant  
GroupID identifies which user-group the applicant belongs to



From ...

Specifies the names of the tables to look in

5 .Where ...

This gives criteria to search for.

Active > 0 eliminates inactive applicants

Data = 'AEJG' means match the data-node whose ID = 'AEJG' (Java)

The rest of the Where ... clause represents other criteria.

10

Note that the select statement is really a series of nested select statements.

Starting from the central statement and working out, first we find all applicants who have Salary less than 100,000 are found.

Second, list is issued as a starting point to generate a list of users who have Salary less than 100,000

15 AND Experience > 5.

Third, the new list issued to generate a list of users who have Salary less than 100,000 AND Experience > 5 and who meet node 'AAND' (Willing to go take a Full Time position).

Fourth the new list is used to generate a list of applicants who have Salary less than 100,000 AND Experience > 5 and who meet node 'AAND' and who meet node 'AAMB' (have a Bachelors degree)

20

This process continues for all the data requirements the hiring manager specifies.

In an alternative embodiment, the profile are stored each as a single record in the database 112. In such an embodiment, the profits (pockets) are generated in

25 accordance with the following rules:

- a packet always begins with a node code
- numeric expression can appear only after a code expression
- year expression can appear only after a code expression or numeric expression
- only flat logical expressions are allowed inside a packet (no parentheses) and only inside list expressions, so something like a&d&(b | f) will have to be rearranged into a&b&d | a&d&f
- logical expressions must be stored in an alphabetical order, so d&f&a | a&b&d and b&a&d | a&d&f are both incorrect whereas a&b&d | a&d&f is correct.

35

Example:

ADFG@BT6/8&LSZV:BAWE|BBQR#BT10/20&BCFL#GE8:CFG0:KJIB#6&KFHY|KY  
TR+KEZM12:

5 On the average, packet length will be:

- Focus, fields and skills - 160 bytes
- Company [Type and Size] - 30 bytes
- Job [Type and Length] - 30 bytes
- Compensation - 20 bytes
- 10 • Management Experience - 25 bytes
- Spoken Languages - 15 bytes
- Education - 20 bytes
- Citizenship/Visa Status - 15 bytes
- Security Clearance - 15 bytes
- 15 • Location - 15 bytes
- Relocation - 35 bytes

Altogether a profile average length is approximately 400 bytes. Maintaining a second copy for display purposes (used for equivalents), results in about 800 bytes per profile.

20 Matching of such products is generally preferred as previously described herein.

**WHAT IS CLAIMED IS:**

1. A network based recruiting system comprising:  
a job description module which generates a job profile corresponding to predefined characteristics of a job position, in response to inputs by a first user of said  
5 system;

an applicant description module which generates an applicant description profile corresponding to predefined characteristics of an applicant, in response to inputs by a second user of said system; and

10 a database for storing a plurality of said job profiles and for receiving said applicant description profile over said network and for matching characteristics of said applicant description profile with corresponding characteristics of said job profiles.

2. A network based recruiting system as set forth in claim 1 wherein said job profile comprises at least one packet, said packet being formatted to comprise:

15 a plurality of alphabetic characters;

a plurality of numerical digits; and

a plurality of operators indicating relationships between combinations of said alphabetic characters and said numerical digits.

20 3. A network based recruiting system as set forth in claim 2 wherein said plurality of operators comprise:

at least a first logical operator for describing a logical relationship between a first and a second of said alphabetic characters and between a first and a second of said numerical digits; and

25 at least a first comparison operator for comparing said first and second of said alphabetic characters and comparing said first and second of said numerical digits.

---

4. A network based recruiting system as set forth in claim 3 wherein said plurality of operators further comprise a list operator for designating a beginning and  
30 an end of a string of said alphabetic characters.

5. A network based recruiting system as set forth in claim 3 wherein said plurality of operators further comprise a numeric operator for designating a beginning of a numeric expression comprising a plurality of said numerical digits.

6. A network based recruiting system as set forth in claim 3 wherein said comparison operator comprises a between operator which designates a numerical range.

7. A network based recruiting system as set forth in claim 3 wherein said plurality of operators further comprise a preference operator which indicates a preference designated by a string of at least a first of said numerical digits.

8. A job data matching system which causes information to be stored to and retrieved from a data base, comprising:

a first profile generator which generates a position description profile, in response to data entered by a first user of said system, said first information profile comprising first encoded information for a plurality of predefined categories of a job position, said first profile generator causing storage of said position description profile in said database which stores a plurality of said position description profile; and

a matching module which responds to an applicant description profile, said applicant description profile comprising second encoded information for said plurality of predefined categories, said matching module comparing said second encoded information in said plurality of predefined categories with said first encoded information in corresponding categories in at least a first of said position description profiles in a predefined comparison sequence.

9. A job data matching system as set forth in claim 8 wherein said matching module compares said second encoded information to said first encoded information in accordance with a plurality of logical and arithmetic operators.

10. A job data matching system as set forth in claim 9 wherein said matching module stores match result information, indicative of a match between said first encoded information and said second encoded information to said database.

5 11. A job data matching system as set forth in claim 8 wherein said encoded information is organized as a plurality of nodes, each of said nodes comprising:  
an identification code which uniquely identifies said node in said database;  
a parent code which identifies a parent node of said node; and  
an equivalence code which identifies a different node which is equivalent to said  
10 node.

12. A job data matching system as set forth in claim 11 wherein said nodes further comprise:

a caption code which designates a character string associated with said node;

15 a minimum value node which designates a minimum integer value associated with said node; and

a maximum value node which designates a maximum integer value associated with said node.

20 13. A job data matching system as set forth in claim 8 wherein said applicant description profile is generated by said profile generator in response to information entered by a second user of said system.

14. A job data matching system as set forth in claim 13 further comprising means for receiving said information entered by said second user into a device

25 communicating with said system across a wide-area network.

---

15. An internet-based system for matching job openings with candidate information comprising:

a job profile generator which creates a job opening data profile containing  
30 encoded information corresponding to a plurality of predefined categories for a job opening;

a database which stores a plurality of said job opening data profiles;

an applicant data profile generator, responsive to encoded information received over said internet from an applicant, for creating an applicant data profile, which contains encoded information corresponding to said plurality of predefined categories

5 for said job opening; and

a data profile matcher, responsive to receipt of said applicant data profile, for comparing, in accordance with a predefined comparison protocol, said applicant data profile to said job opening data profiles stored in said database and storing results of said comparison to said database.

10

16. An internet-based system as set forth in claim 15 wherein said encoded information comprises a plurality of characters, digits and operators which define interrelationships between said characters and between said digits.

15

17. An internet-based system as set forth in claim 16 wherein said encoded information is formatted into a plurality of fields said fields comprising:

an experience field indicative of a level of practical experience;

a compensation field indicative of a level of compensation; and

a degree field indicative of a level of education.

20

18. An internet-based system as set forth in claim 15 wherein said predefined comparison protocol comprises comparing fields of said job opening data profiles with fields of said applicant data packet in a predefined sequence.

25

19. A computer-implemented process comprising the steps of:

generating a job description data profile comprising information describing predetermined aspects of a job opening, in response to inputs received from a first user, said job description data profile comprising a plurality of fields and being formatted in accordance with a predefined format;

30

storing said job description data profile to form a database of job description data profiles;

generating an applicant data profile comprising information describing predetermined aspects of an applicant, in response to inputs received via an asynchronous communications medium from a second user, said second user being located remotely from said first user, said applicant data profile comprising a plurality of fields, which correspond to said fields in said job description data profile, said applicant data profile being formatted in accordance with said predefined format; and responding to generation of said applicant data profile by retrieving said job description data profile from said data base and comparing said applicant data profile to said job description data profile in accordance with a predetermined comparison operation which prioritizes a plurality of said fields.

20. A computer-implemented process as set forth in claim 19 wherein said predetermined comparison operation comprises:

comparing a job experience value in an experience field in said job description data profile to an applicant experience value in an experience field in said applicant data profile to determine if said applicant experience value is greater than or equal to said job experience value; and

comparing a job compensation value in a compensation field in said job description data profile to an applicant compensation value in a compensation field in said applicant data profile to determine if said applicant compensation value is less than or equal to said job compensation value.

21. A computer-implemented process as set forth in claim 19 wherein said predefined format comprises:

a plurality of alphabetic characters;

a plurality of numerical digits; and

a plurality of operators which define interrelationships between said alphabetic characters and between said numerical digits.

22. A computer storage medium containing a recruiting system which causes generation of a candidate profile and a job profile and which matches candidate profiles to job profiles, the recruiting system comprising:

a profiling module, responsive to inputs from a first user, for creating said job profile, said job profile comprising a plurality of fields, each of said fields containing information encoded in accordance with a predefined format; and

an automatch module, responsive to said candidate profile and said job profile, said candidate profile comprising said plurality of fields containing information encoded in accordance with said predefined format, said fields in said candidate profile containing encoded information corresponding to said candidate and said fields in said job profile containing encoded information corresponding to said job, said automatch module comparing fields in said candidate profile to corresponding fields in said job profile in accordance with a predetermined comparison protocol.

23. A computer storage medium as set forth in claim 22 wherein said recruiting system further comprises means for causing said job profile to be stored to a database which stores a plurality of said job profiles.

24. A computer storage medium as set forth in claim 23 wherein said recruiting system further comprises means for causing storage of a billing entry, corresponding to said job profile, in said database.

25. A computer storage medium as set forth in claim 22 wherein said profiling module is further, responsive to inputs received from a second user of said recruiting system, for generating said candidate profile.

26. A computer storage medium as set forth in claim 25 wherein said security system further comprises means responsive to said profiling module for generating matches between said job profile, with said candidate profile in response to completion of fields in said job profile by said first user.



27. A computer storage medium as set forth in claim 22 wherein said recruiting system further comprises a first notification means, responsive to a status field in said candidate profile, for causing notification to at least said first user, of a status of a candidate corresponding to said candidate profile, said status including an active status and an inactive status.

28. A computer storage medium as set forth in claim 22 wherein said recruiting system further comprises a second notification means, responsive to said automatch module for causing transmission of a notification message to a candidate corresponding to said candidate profile that meets criteria specified by said predetermined comparison protocol.

29. A computer storage medium as set forth in claim 27 further comprising a profile limit for limiting a candidate profile for any candidate to a predetermined number of profiles.

30. A computer storage medium as set forth in claim 28 further comprising a profile deletion module responsive to a user input for deleting a selected profile.

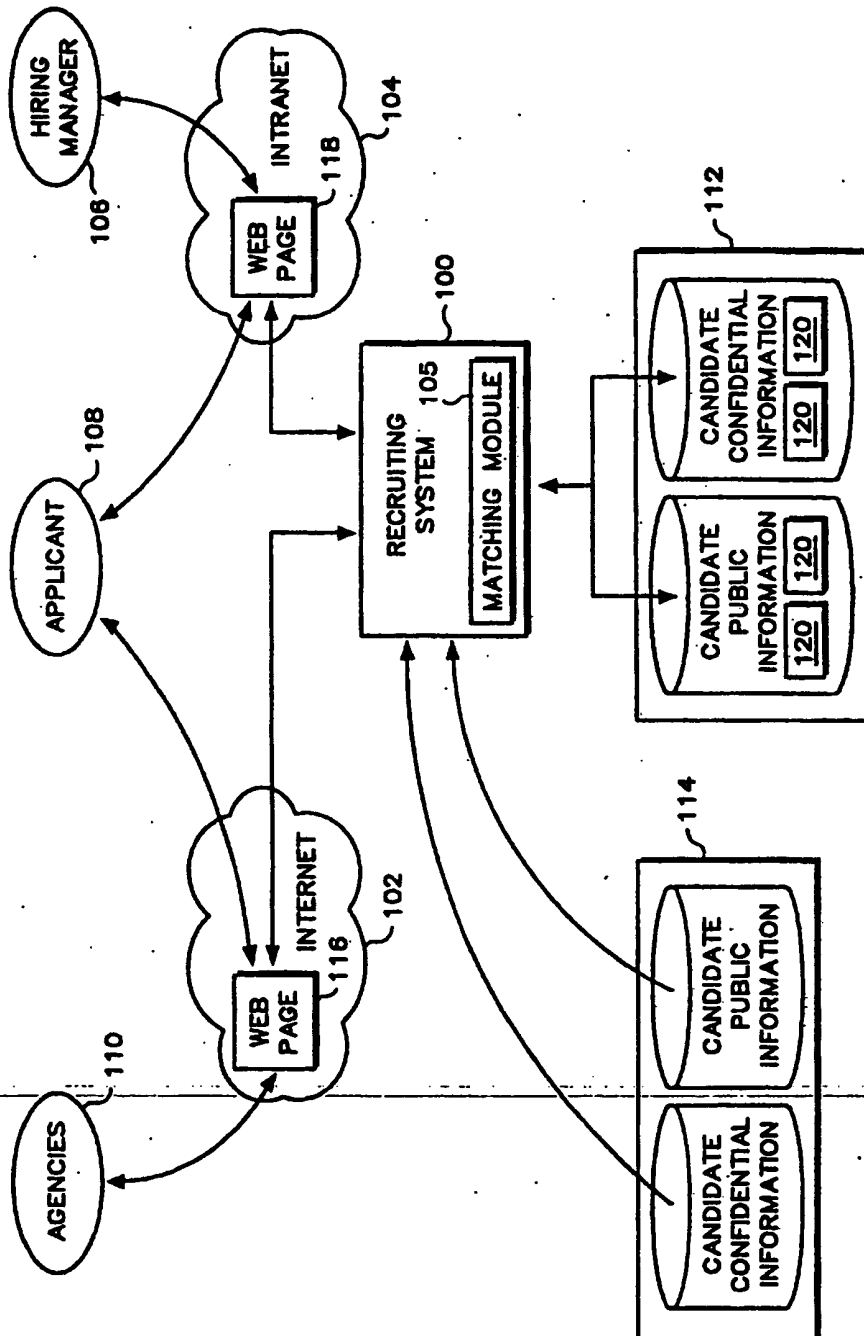


FIGURE 1

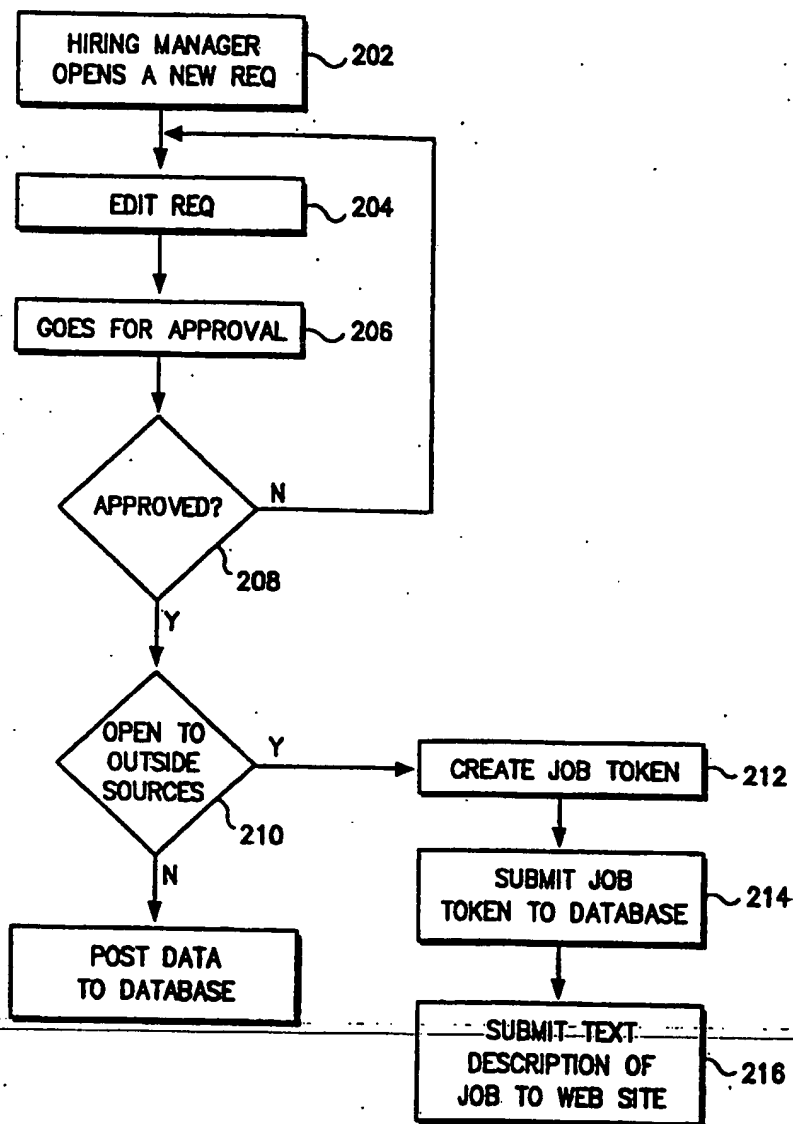


FIGURE 2

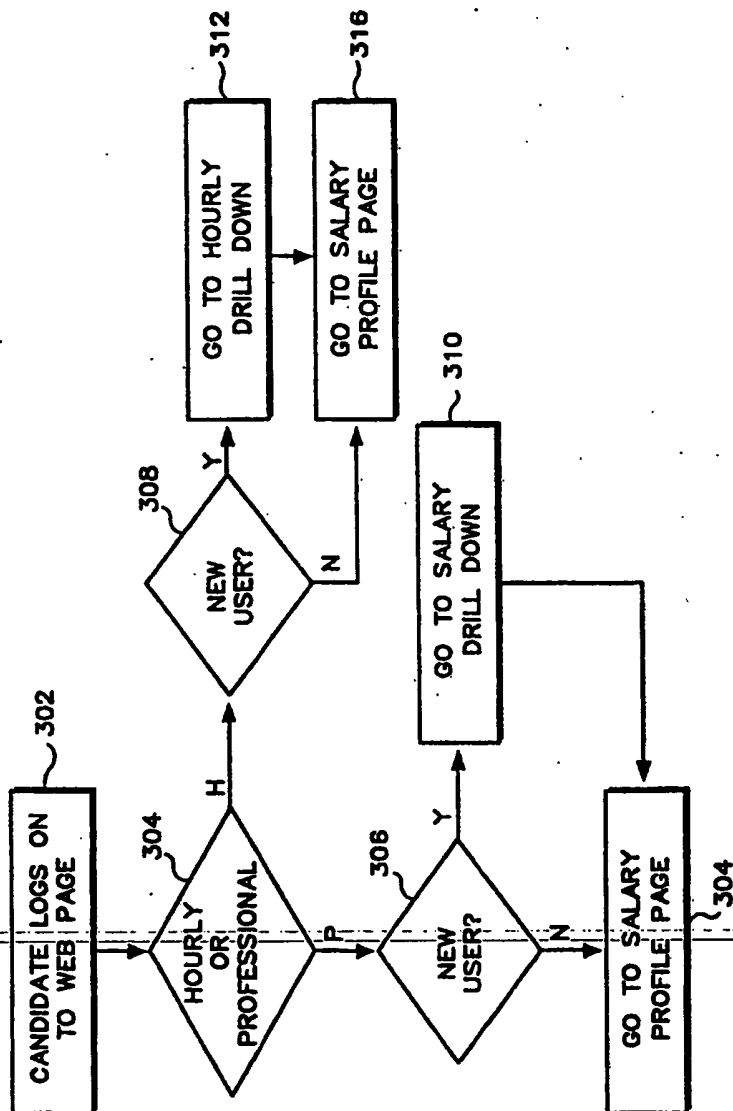


FIGURE 3A

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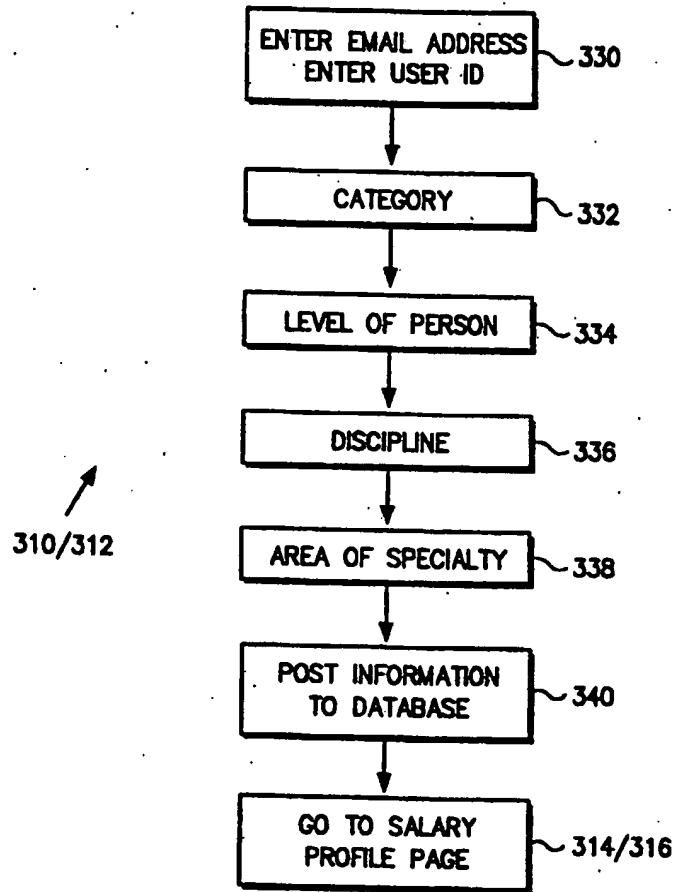


FIGURE 3B

5/11

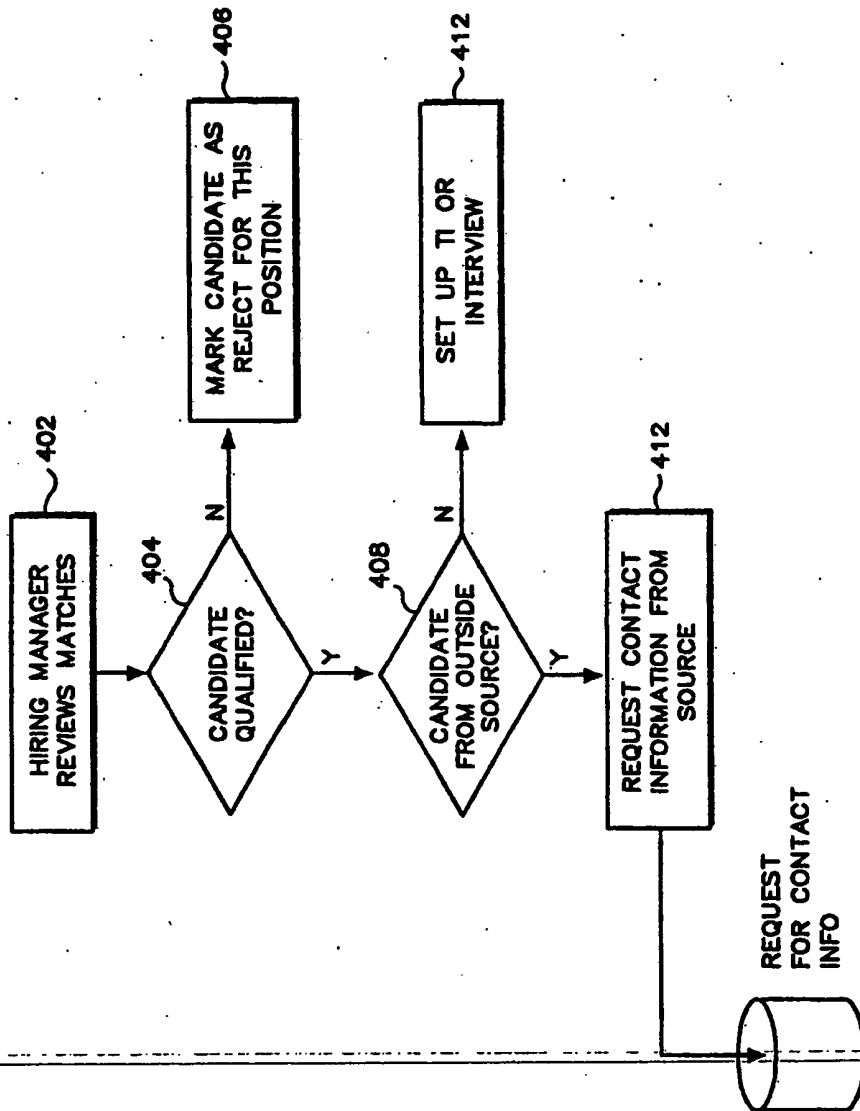


FIGURE 4A

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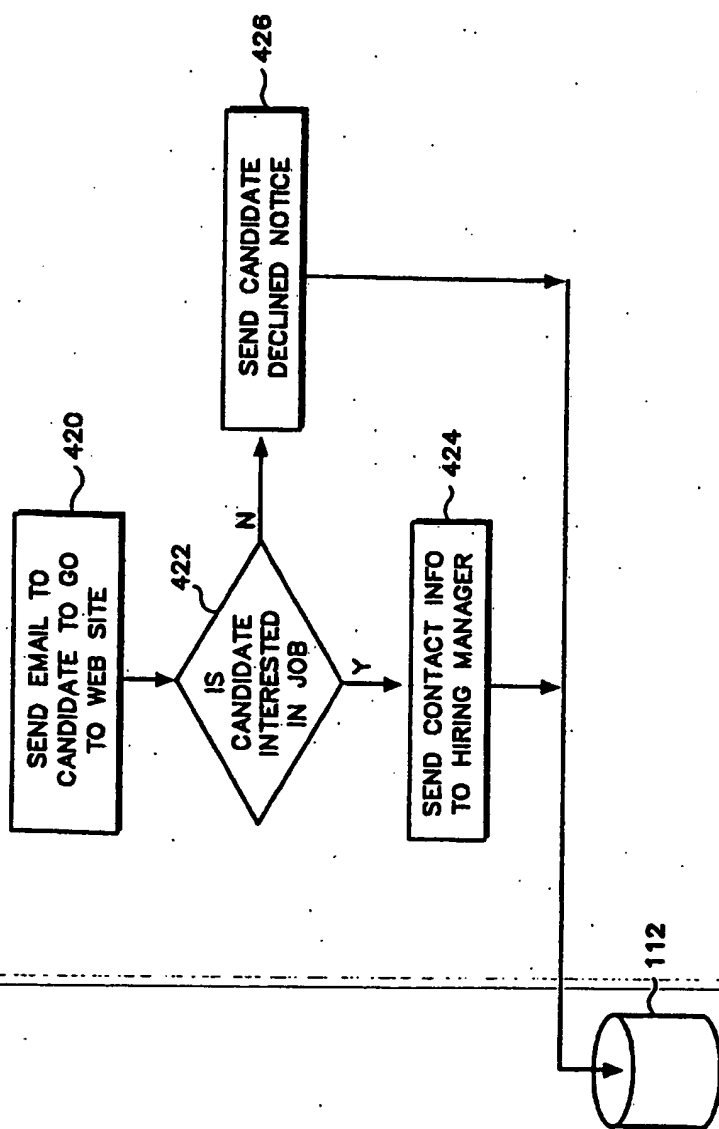


FIGURE 4B

7/11

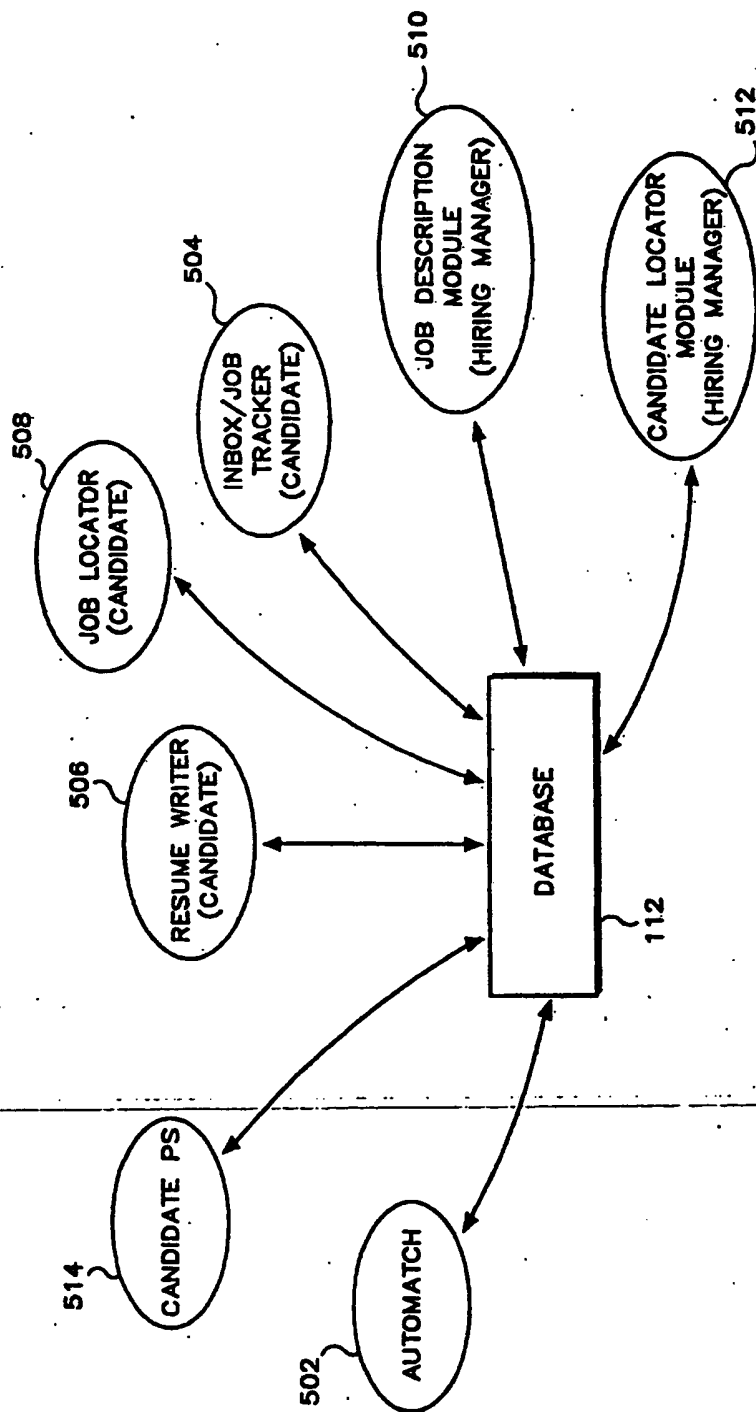
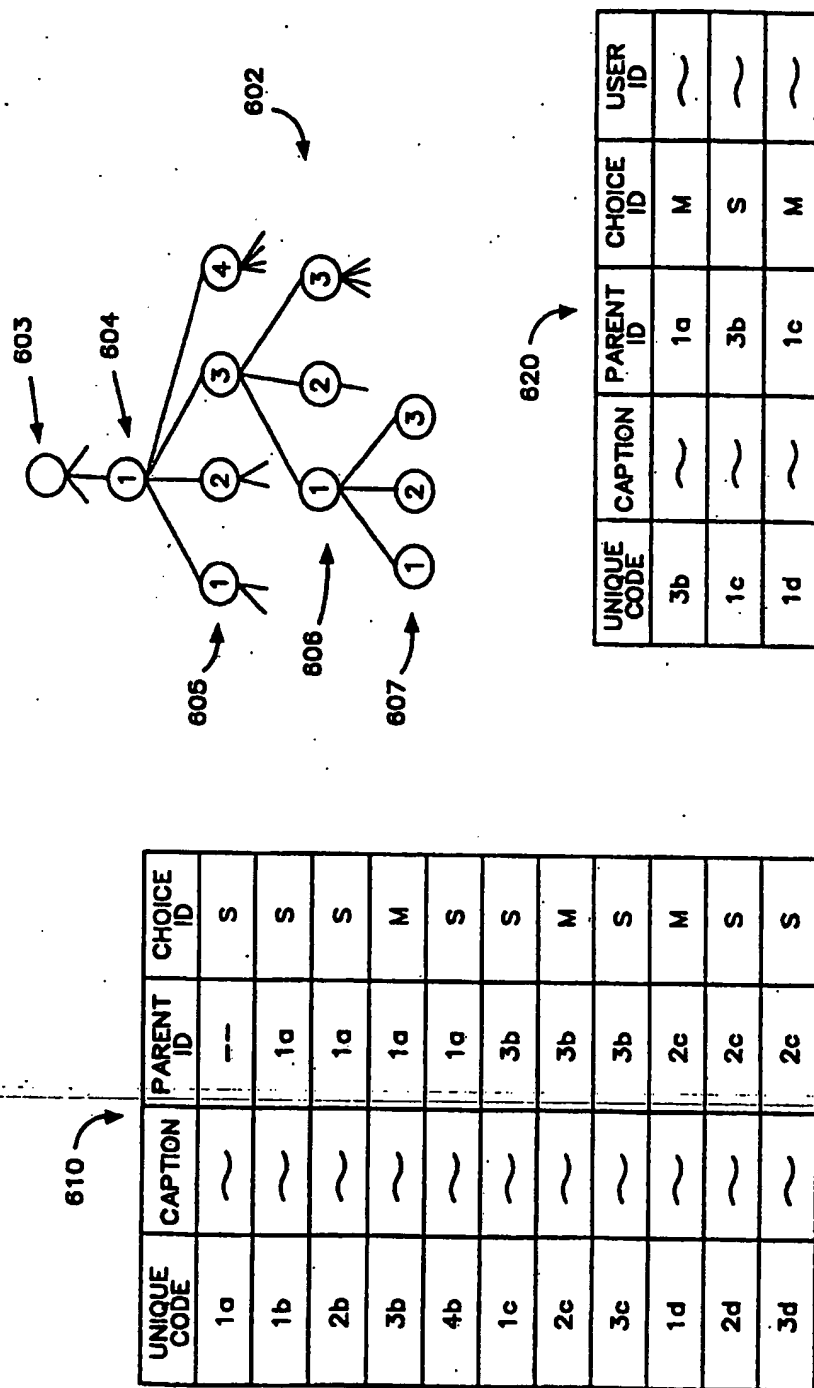


FIGURE 5





## FIGURE 6

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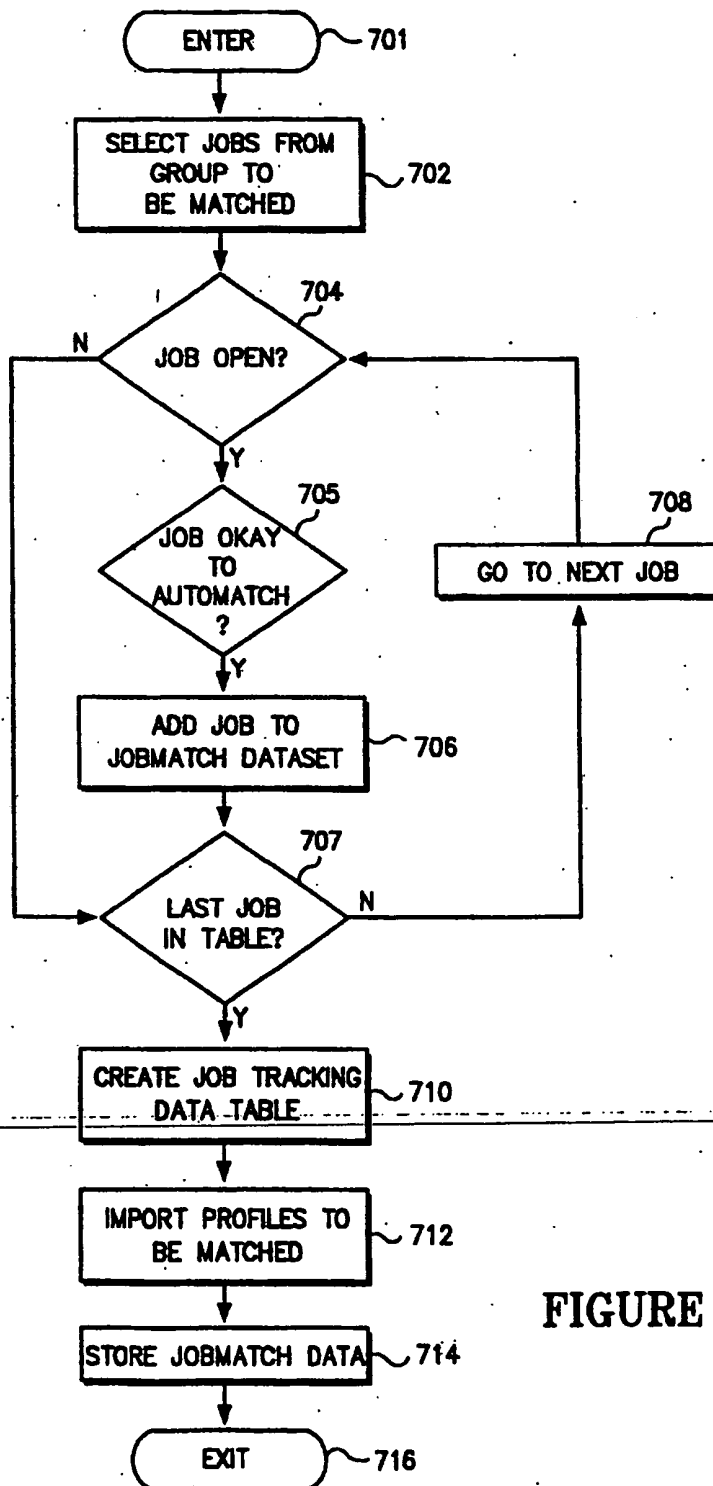


FIGURE 7

10/11

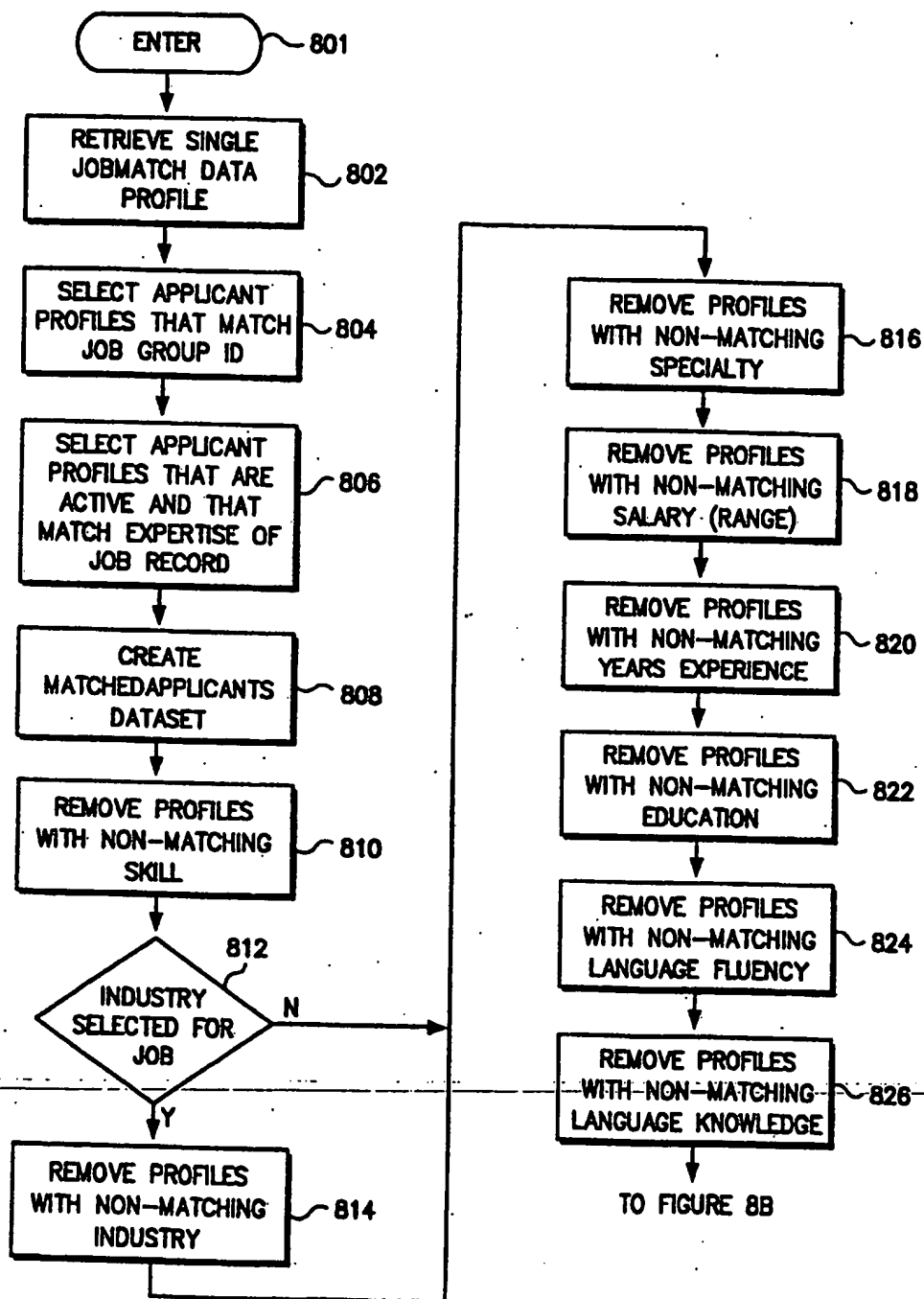


FIGURE 8A

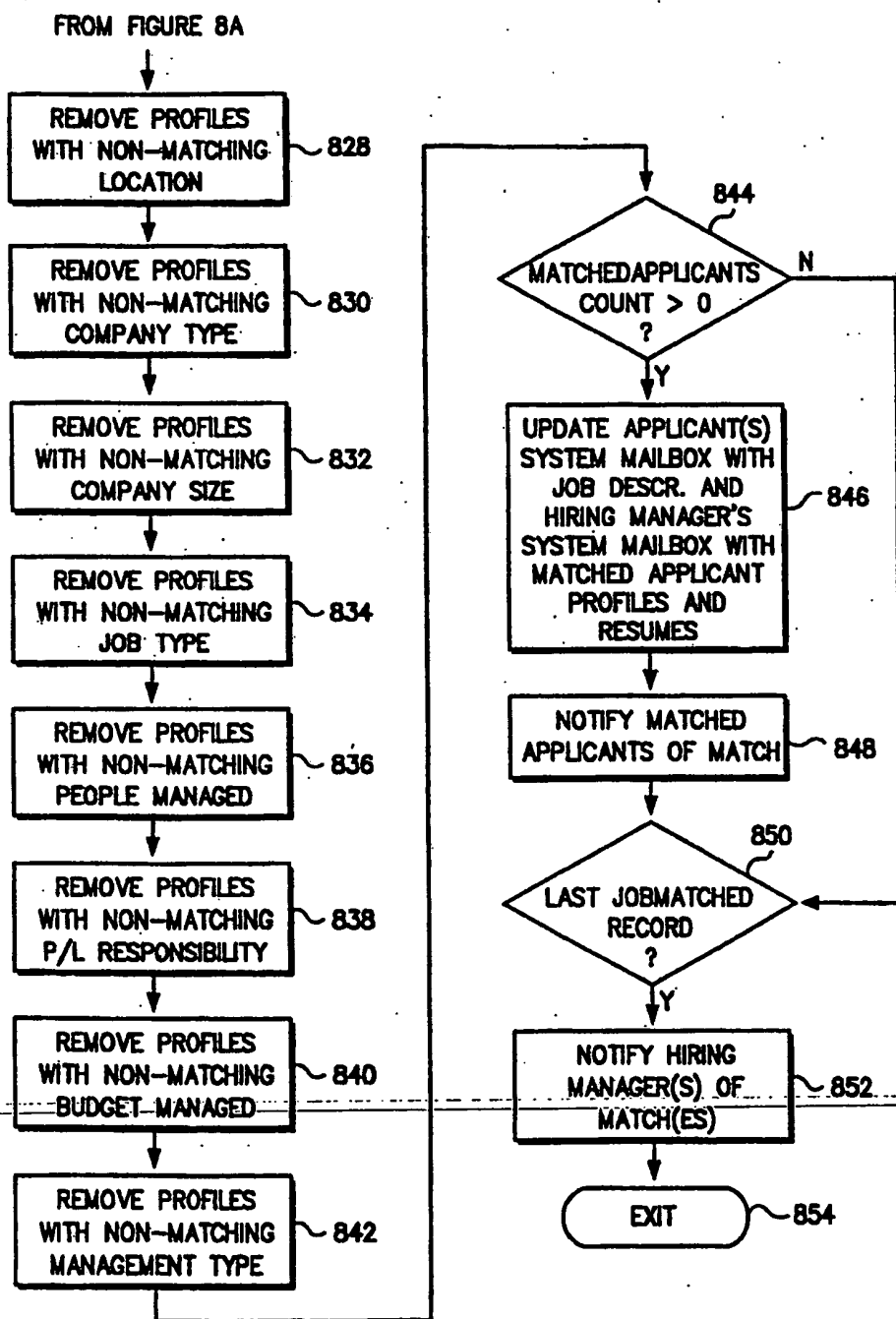


FIGURE 8B

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